Project Descriptions of Fire Ecology/Fuels Data within the Alaska Region National Park Service *FFI Database: AK_WEST*

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Parks included in this database:

- Denali National Park & Preserve in Alaska
- Noatak National Preserve in Alaska
- Bering Land Bridge National Preserve in Alaska
- Lake Clark National Park & Preserve

Projects in Database:

BELA-Fairhaven-HZF Bering Land Bridge NP Fairhaven Ditch Cabins Fuels Thinning (2012)

FFI & Data Management: All data has been entered into FFI (Database: FFI-AKWEST, Project: BELA-Fairhaven-HZF). Data collection year: 2012.

Purpose: In 2012 the NPS Alaska Western Area fire management crew conducted a vegetation fuels reduction project around two historic structures (Fairhaven Ditch Cabins 2 and 3) in Bering Land Bridge National Preserve. Vegetation around these cabins consisted mostly of tall willow, shrub birch, dwarf shrubs, and herbaceous plants. These cabins were built in approximately 1906 as part of the 38 mile Fairhaven Ditch which was constructed to provide water for gold mines along the Inmachuk River drainage. The goal of the fuels reduction was to reduce the tall shrubs around the cabins to better enable firefighters access to the site if the cabins needed protection from a wildfire. The specific fuels treatment objectives were to cut tall shrubs out to 50 ft from the cabins and to remove 80% of the tall shrub cover. Monitoring plots were established to determine if the treatment objective was met.

Sampling: Pre-treatment monitoring plot data was collected just prior to the fuels treatment and re-measured immediately post treatment in mid-June of 2012.

Methods: Four 16-m transects were established to document shrub reduction in the treatment area to evaluate the success of the hazard fuels treatment in meeting prescription objectives. At each transect photos were taken and data collected included: vascular and non-vascular plant ocular cover, point intercept cover measurements of vegetation and ground cover at 32 points, and soil temperatures at 8 points. Plot locations were only recorded with a garmin GPS, no plot markers were utilized.

DENA-CAKN-CBI Denali Burn Severity and CAKN Mini-Grid Monitoring (2014)

FFI & Data Management: All data has been entered into FFI (Database: FFI-AKWEST, Project: DENA-CAKN-CBI). Data collection year: 2014.

Purpose: In 2013 Denali had 14 fires including several large fires with a total of 104,850 acres burned within the park boundaries. Based on the fire perimeters, it appears that 4 Central Alaska Network I&M (CAKN) permanent vegetation mini-grids burned or partially burned during the 2013 fire season. In addition, some of these plots have had multiple fire events in the past 2-20 years, which is a short fire return interval for black spruce. This provided an opportunity to assess burn severity and improve our understanding of how fire changes vegetation, permafrost, soils and other factors such as wildlife habitat. Monitoring objectives included: 1) verify ground based burn severity (CBI) in comparison to remotely sensed burn severity maps, 2) assess initial 1 year post-fire effects, and 3) provide CAKN I&M Program with ground based burn severity, repeat photos and other site information.

Sampling: A total of 39 plots were sampled in 2014 across two CAKN mini-grids. Fourteen plots were sampled in the Beaver Log Mini-Grid (burned in 2013 Beaver Log Lakes Fire) and twenty-fire plot were sampled in the Wigand Mini-Grid (burned in 2013 Toklat River East Fire). Two plots in the Wigand Mini-Grid burned in both 2013 and 2011.

Methods: Plots are set up as 8m radius circular plots with 2 perpendicular crossed 16m transects. Plot center is at 8m and marked with metal conduit poles on the Wigand mini-grid and survey caps on the Beaver Log mini-grid. Magnetic north was used to set transect azimuths (No declination used). Transects are laid out running North-South and East-West with the 0m ends at magnetic North and West. Plot data collection includes: vascular and non-vascular species ocular cover estimates, burn severity scores based on the Composite Burn Index (CBI) methods (Key and Benson 2006), active layer depths and soil temperatures (8 points on 16m north-south transect), tree seedling densities (4 quadrats per plot), and plot photos (1 from each transect end facing in and 1 ground photo at plot center).

Seedling quadrat layout differs between mini-grids. Wigand Mini-Grid seedling quadrats were 2m x 2m and were placed on the clockwise side of the tape with their inside, centermost corner placed on the following transect marks: 1) West/East Transect – Quadrats at 4-m (Quad A) and 11-m (Quad D) and 2) North/South Transect – Quadrats at 6-m (Quad C) and 13-m (Quad D). Beaver Log Mini-Grid seedling quadrats were 2m x 1m and placed with the 2m side perpendicular to the transect line, centered with 1m on each side of the transect tape.

DENA-HZF Denali Headquarters Hazard Fuels thinning plots (2003 – 2009)

FFI & Data Management: *Only partial data has been entered into FFI, only thinned plots were entered and only general site information (Macroplot and Sampling Event) and Brown's transect data are included in FFI.* Remaining data is in an Access database.

Purpose: The purpose of this study is to document the pre and post condition of the vegetation and fuels around structures scheduled to have mechanical fuels thinning in the Denali Front Country. Specifically, the goals of this study are to 1) evaluate the implementation of the hazard fuels prescription, 2) monitor the effects of the fuels treatments on vegetation and fuels, and 3) model the effects of the fuels treatment on fire behavior.

Sampling: Monitoring plots were established within thinning treatment zones and control sites at Denali NP/Pr Headquarters and Visitor Center area. 27 plots were established in 2003, 1 year prior to the hazard fuels reduction treatment in 2004. The plots were re-measured in 2005 and 2009. Some plots were dropped due to construction in places.

Methods: Twenty-seven plots were established in 2003, pre-thinning. Plots are 8-m radius circular plots, with a 16-m transect running North to South. The most intensive thinning treatment was applied closest to buildings; Zone 2 (High thinning: 0-30 ft from structure) and Zone 3 (Moderate thinning: 30-100 ft). The number of plots by treatment type are as follows: Control – 10 plots (1 in Toklat), Zone 3 – 11 plots (1 in Toklat and 1 in backcountry not counted here, but in database), and Zone 2 – 6 plots. At each visit photos were taken of each plot and data collected included: vascular and non-vascular plant ocular cover, point intercept cover estimates of vegetation and ground cover, tree densities, tree measurements, active layer depths, Brown's woody transects, and general site descriptions. All plots were marked with wooden stakes at the center of the plot, with the exception of 7 plots which had metal survey cap markers.

DENA-LC-CBI Denali Landcover-CBI Plots (2007)

FFI & Data Management: Data has been completely entered into the FFI (Database: FFI-AKWEST, Project: DENA-LC-CBI). Methods and data entry follow instructions for Alaska NPS FFI Fire & Fuels Plot data entry and use of UV fields are common.

Purpose: The purpose of this project was to determine 5 yr succession patterns under varying burn severity levels and to develop a landcover change matrix in order to update the Denali Landcover (vegetation) map in recently burned areas. In July of 2007 we installed 55 fire effects plots in Denali. Plot locations were based on the 2002 CBI plots established on 4 fires in Denali that burned in 2000 and 2001. Objectives of this study were to:

1. Utilize plots to ground truth and map vegetation and fuel types within recent fires and to develop succession models for vegetation change post fire in relation to burn severity.
2. Determine impacts of burn severity on vegetation, ground cover and soil properties.
3. Monitor for invasive plants within recent fires.

Sampling: In 2007, 55 plots were established in Denali. Plots are 30-m x 1-m belt transects and marked with GPS coordinates only. Plots were selected and sampled from the earlier 2002 CBI plot sites.

Methods: Plots were 30-m x 1-m belt transects marked with GPS. Plot data collection includes: vascular and non-vascular species ocular cover estimates, point intercept to measure ground and vegetation cover, tree density by species and diameter size class within 30-m^2 area, tree measurements, thaw depths, burn severity points along transect, moose browse shrub density, general site descriptions and photo points. *Protocol:* AKR Fire and Fuels Monitoring Protocol Belt Transect 2011.docx (and earlier versions of this protocol)

DENA-VDM Denali Videography-Moose Fire Plots (2005 – 2011)

FFI & Data Management: Data has been completely entered into the FFI (Database: FFI-AKWEST, Project: DENA-VDM). Data entry methods follow the Alaska NPS FFI Data Entry Instructions document and use of UV fields are common. Note that tree measurement fields are entered different than other AKR NPS data sets, the Crown Fuel Base Height (aka Height to Dead Ladder Fuel) data is entered in the Ladder Mx. Ht. field in FFI. Also all of the tree crown measurement fields are entered in meters,

whereas other AKR NPS crown fields are in centimeters. Data was collected in 2005 and for a subset of 10 plots in 2006 and 2011.

Purpose: Fuels and vegetation maps atrophy over time and become less relevant in fire prone areas, due to burned areas no longer representing the appropriate vegetation or fuel types. In Denali the northwest portions of the park has had frequent large fires and the landcover map that was developed in 1990, and had become outdated due to the areas burned. This study was implemented to develop a predictive model of update the landcover vegetation map based on time since fire and burn severity. In addition there was an interest in utilizing the plot data to assess moose browse availability in the burned areas. In order to accomplish these objectives fire effects plots were established in a range of time since past fire and data was collected to help develop the predictive model.

Sampling: In 2005, forty-three fire effects plots were established in Denali National Park & Preserve in the Northwest portion of the park along 100 km video transects. Plots were established 1-5 year old fires and 10-20 yr old fires and some unburned sites. Later that summer, 10 of these plots were burned again by the 114,000 acre Highpower Creek fire. These 10 plots were permanently marked and re-measured again in 2006 and 2011 to determine the impacts of shortened fire return intervals on vegetation**.**

Methods: Plots were 30-m x 1-m belt transects marked with GPS. 10 permanent plots in the Highpower Fire were marked with rebar. Plot data collection includes: vascular and non-vascular species ocular cover estimates, point intercept to measure ground and vegetation cover, tree density by species and diameter size class within 30-m^2 area, tree measurements, moose browse shrub and tree densities, thaw depths, burn severity points along transect, moose browse shrub density, general site descriptions and photo points. *Protocol:* AKR Fire and Fuels Monitoring Protocol Belt Transect 2011.docx (and earlier versions of this protocol)

NOAT-UVG-PPF Noatak Pre-Post Fire Uvgoon 2004 Fire (2004 – 2013)

FFI & Data Management: All data has been entered into FFI (Database: FFI-AKWEST, Project: NOAT-UVG-PPF). Data entry methods follow the Alaska NPS FFI Data Entry Instructions document. Data was collected in 2004, 2005, 2007 and 2013.

Purpose: In 2004, very few long term studies on the effects of tundra fires on vegetation or soils had been established in Alaska. In late May of 2004 a large tundra fire occurred in Noatak National Preserve. As part of a pilot study to determine the feasibility of installing fire effects plots in front of an active fire, the fire crew for the AK Western Area Fire Management decided to install plots on this fire. By the time they were able to mobilize to the fire, the fire had largely stopped burning. So instead of installing plots in front of the fire, they selected 3 burned and 3 unburned control sites along the fire perimeter. Because the plot locations were randomly selected from the air, some of the burn plots were established in areas that had burned twice and also some of the control plots had actually burned within the last 20 years prior. These plots were permanently marked and have been re-measured since initial installation.

Sampling: Noatak NP Paired Burn Plots - Uvgoon Fire 2004 Fire #127. Plots were established in In 2004, NPS fire staff established six plots after the 2004 Uvgoon Creek fire (Fire #127) in Noatak National Preserve in tussock tundra plots and revisited those plots in 2005 and 2007. Plots were

established 1 week after the fire occurred and are paired, one burn plot and a paired control plot established. Plots beginning in A were considered control plots and beginning in B were burned plots. For example: A001 and B001 are pairs.

Methods: 30m x 1m belt transect plots were photographed and marked permanently with rebar. Data collected at each plot included: vascular and non-vascular plant ocular cover estimates, point intercept cover estimates of vegetation and ground cover, tree density (where present), thaw depths, burn severity, photo points and general site descriptions. *Protocol:* AKR Fire and Fuels Monitoring Protocol Belt Transect 2013.docx (and earlier versions of this protocol)

NOAT-CBI-Carbon-2010 Fires (2011)

FFI Data: Data has been completely entered into the FFI (Database: FFI-AKWEST, Project: NOAT-Carbon-2010 Fires). Data was collected in 2011 only. Data entry methods follow the Alaska NPS FFI Data Entry Instructions document.

Purpose: This project was established to assess tundra fire burn severity and age of organic soils that are burned in tundra fires. Tundra fires often burn into the organic soil material which can impact vegetation succession and have the potential to release ancient stored carbon. Burn severity, vegetation cover and organic soil monoliths were recorded or collected from four large 2010 wildfires in Noatak National Preserve, Alaska. The objectives of this study were to: (1) investigate how burn severity and fire return intervals influence the release of carbon from tundra soils and (2) assess burn severity and effects on vegetation.

Sampling: In 2011, thirty-four burn severity and vegetation composition plots were established at 5 of the 37 fires that occurred in Noatak NP in 2010. Twenty-four of these plots had organic soil monoliths collected to assess carbon age.

Methods: Twenty meter diameter circular plots were utilized to record the following information: dominant vegetation classification, ocular estimates of plant, non-vascular and ground cover, and burn severity scores based on the Composite Burn Index (CBI) methods (Key and Benson 2006). At a subset of plots one 20 cm x 20 cm organic soil monolith (OM) was cut to mineral soil or point of restriction by permafrost or seasonal frost. Plot locations were only marked by GPS (Garmin).

NOAT-CBI-Uvgoon-2012-Fire (2013)

FFI & Data Management: All data has been entered into FFI (Database: FFI-AKWEST, Project: NOAT-CBI -Uvgoon-2012-Fire). Data entry methods follow the Alaska NPS FFI Data Entry Instructions document. Data was collected in 2013.

Purpose: Burn severity influences vegetation patterns, succession after fire, carbon emissions, and many other ecological factors after a fire. This project was designed to assess the remote sensed burn severity maps that are produced utilizing Landsat satellite imagery. As part of the fire monitoring program these maps are occasionally assessed with ground truth plots to calibrate the satellite based burn severity maps with field data. The purpose of this project was to ground truth the burn severity

maps and assess initial effects of the fire on the 2012 Uvgoon Cr #1 and Kungiakrok Cr fires which burned together for a total of 53,825 acres.

Sampling: In 2013, twenty-two plots were measured for burn severity, vegetation composition, and organic soil consumption at the 2012 Uvgoon Cr #1 and Kungiakrok Cr fires.

Methods: Twenty meter diameter circular plots were utilized to record the following information: dominant vegetation classification, ocular estimates of plant, non-vascular and ground cover, and burn severity scores based on the Composite Burn Index (CBI) methods (Key and Benson 2006). Depth of consumption of organic soils was estimated at some plots. Plot locations were only marked by GPS (Garmin).

NOAT-Racine-FirePlots (1982 – 2013)

FFI & Data Management: *Partial data has been entered into FFI* (Database: FFI-AKWEST, Project: NOAT-Racine-FirePlots). Data entry methods follow the Alaska NPS FFI Data Entry Instructions document. Data at these plots have been collected in 1981, 1982, 2005 and for a subset of 2 plots in 2013. A vast majority of the data is still in excel spreadsheets. Only the 2 plots that were measured in 2013 were entered into FFI.

Purpose: In 1981 and 1982 Charles Racine and John Dennis established a series of plots in Noatak National Preserve to monitor the effects of tundra wildfires. These plots were not re-measured until 2005 when NPS AKR Fire Ecologist and Racine relocated and re-measured a majority of the plots established in 1981-1982. 8 burned sites in fires from 1977, 1972 and 1982 were measured to evaluate the long-term effects of tundra wildfires on vegetation and permafrost. In 2012, two of the plots burned again in the 2012 Uvgoon Creek #1 Fire. The objectives of re-measuring these historic plots were to address the following questions:

1. How does time since fire affect the species composition, vegetation structure, and ground cover among varying vegetation types? How will these areas respond to multiple "repeat" fires burning on a shortened fire returned interval?
2. How does the time since fire affect affect depth of active layer (thermokarst development)?
3. Do the vegetation and soil conditions of today suggest the presence of environmental factors in addition to post fire recovery, such as climate change? Particularly in relation to expansion of shrubs and trees, i.e., alder, willow and spruce.

Sampling: Two plots were established in/near a 1982 fire, one within the burned area (KNGB) and outside the burned perimeter (KNGU). Both burned and unburned plots burned in the 2012 Uvgoon Creek #1 Fire. These plots were sampled in 1982, 2005, and 2013. All study sites re-measured in 2005 include: Noatak Site1 (NOAT1), Noatak Site 2 (NOAT2), Noatak Site 3 (NOAT3), Kungiakrok Creek (KNGB and KNGU), Uchugrak Hills (UCHB and UCHU), and Kugururok (KUGB). As of October 2013, only the Kungiakrok Creek data has been entered into FFI.

Methods: Kungiakrok and other plots were based on 10m x 1m belt transect with 10 1-m x 1-m quadrats. Data collected included: photos, vegetation cover estimates, active layer depths and burn severity estimates utilizing CBI methods. Ends of the transects at Kungiakrok were marked with rebar

and magnetic buried survey markers. Other plots have markers. Trimble GPS locations were recorded for Kungiakrok plots in 2013.

LACL-CBI Lake Clark National Park and Preserve CBI Plots (2014)

FFI & Data Management: All data has been entered into FFI (Database: FFI-AKWEST, Project: LACL-CBI). Data collection year: 2014.

Purpose: Two large fires burned in 2013 in Lake Clark National Park & Preserve: Currant Creek and Kristin Creek. The 2013 fire season was fairly active and visible for the park and public, with the Currant Creek Fire only 15 miles from Port Alsworth. There has been very little ground based post fire monitoring in Lake Clark since the early 1980s. Monitoring these fires will provide calibration of burn severity products (dNBR burn severity maps produced by the MTBS program and USGS) in an area where we have no previous field data. The Southwest Alaska I&M Network plant ecologist has expressed an interest in establishing long term monitoring plots in conjunction with these fires and will provide personnel to assist with the field work. The purpose of monitoring these fires in 2014 was to:

1. Verify burn severity and perimeter maps
2. Assess initial fire effects
3. Provide site information for potential establishment of long term monitoring plots for the SWAN Network

Sampling: Sampling plots were selected using GIS process based on capturing a variety of burn severity levels and pre-fire vegetation types. A total of 50 plots were measured with 43 on the Currant Creek Fire and 7 on Kristin Creek Fire. GPS(Garmin 76CSX) coordinates were collected but the plots were not permanently marked. Weather and other factors prevented additional sampling on the Kristin Creek Fire.

Methods: Fifteen meter radius circular plots were used to collect plot data including: ocular estimates of pre- and post-fire vegetation cover, burn severity (using the Composite Burn Index or CBI methodology), active layer depths and soil temperatures at 5 points along the 30-m transect, and tree seedling density (tallied in 3 1-m radius subplots at 3-m, 14-m and 27-m on the 30-m transect). Plot photos were taken facing each cardinal direction along with one ground photo at plot center. GPS coordinates were collected for plot center.